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A Note on Price Stabilization

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By P. Berck

Conditions under which a country, firm, or individual would prefer stabilized prices have been adduced since Waugh's paper [5]. Despite the prominent place this issue has in agricultural policy and the number and stature of the commentators, there is far less than agreement about the desirability of stabilization. Much of the disagreement, however, can be resolved by spelling out more clearly each of the author's positions with respect to the key issues of uncertainty and of consumer savings. When the differences in assumptions are resolved, the general conclusion would seem to be that a consumer or a small economy is made better off by external instability.

The problem of instability naturally arises in commodities, such as grain, which are dependent on an underlying stochastic variable (weather). Because of such an underlying uncertain variable, a consumer or small country which purchased grain or bread would view the situation as one in which the price in the next market period is uncertain and the price over the next several periods is unstable.

Instability means that some price varies over time. That is, $P_1 \neq P_2 \neq P_3$ in at least some of its vector components. Stabilization is usually but not always taken as a program that achieves a new set of prices,

$$P^* = \frac{1}{n} \sum P_i,$$

that are equal to each other and to the arithmetic mean of the original prices P_1, \dots, P_n .

The question asked is whether or not the consumer would prefer the uncertain, unstable prices or the mean price in each subsequent market period.

A consumer in an unstable world is usually described by a utility function W additive over market periods,

$$W = \sum u_i(x_i),$$

and a budget constraint. The budget constraint has two natural forms,

$$y_i = \bar{y}, \quad y_i = P_i x_i$$

and

$$\sum y_i = \bar{y}, \quad y_i = P_i x_i.$$

The first case would obtain if the consumer were unable to channel income from one period to the next. Something like it arises if the consumer cannot transfer income after the price is revealed; that is, there is a real element of a gamble and all of the issues standardly associated with uncertainty will matter very much. To the contrary, the second constraint (more natural to cake-eating problems) is the case spoken to by the instability with certainty (!) models and the more elegant Bewley Permanent-Income model; here, the typical uncertainty issues matter not at all.

By using an indirect felicity function, the consumer's problem can be greatly simplified. After a consumer has decided how much purchasing power to allot to a time period (y_t), he chooses a felicity-maximizing bundle x_t subject to $P_t x_t = y_t$. The result of this process is the indirect felicity function $v(P_t, y_t)$ which is known to be increasing in y , decreasing in P , and quasiconcave in P . A restatement of the consumer problem is

$$\max V = \sum v(P_i, y_t),$$

subject to either $y_t = \bar{y}$ or $\sum y_t = \bar{y}$. The term "felicity function" for u and v

is deliberate. It avoids confusion over cardinality: W is ordinal and u is "cardinal"; thus, the utility function is most definitely ordinal. The restatement of the problem brings up one other issue--that of risk aversion. If the consumer is able to transfer funds from one period to another and if v'' is positive, then the consumer will spend all of his income in one time period. Thus, instability (which implies many time periods) and savings together are incompatible with risk-loving.

In the case where income can be transferred but there is certainty, let

$$V(P_1, \dots, P_n, y_n) = \max_{y_t} \sum v(P_t, y_t),$$

subject to $\sum y_t = \bar{y}$.

The consumer's desire (or lack of it) for a stabilization program now amounts to the resolution of the inequality,

$$V(P_1^*, \dots, P_n^*, \bar{y}) \stackrel{>}{\stackrel{<}{\approx}} V(P_1, \dots, P_n, \bar{y}).$$

In the case of perfect certainty, it is not difficult to show that consumers prefer instability. The result is originally due to Waugh [5], and a similar result is proved for a firm by Oi [3].

Proof: Let $e(P, u)$ be the expenditure function dual to the indirect felicity function $v(P, y)$. Let $u^* = v(P^*, y^*)$ where P^* is the stabilized price and y^* is the optimal allotted income. By the construction $V(P_1^*, \dots, P_n^*, y_n)$, it is equal to $n v(P^*, y^*) = n u^*$. Because the expenditure function is convex and by Jensen's inequality,

$$e(EP, u^*) > E e(P, u^*)$$

where E is the expectation operator. Since $EP = P^*$ by definition and $E e(P, u^*)$ is merely $\frac{1}{n} \sum e(P_i, u^*)$, the inequality can equivalently be written as

$$e(P^*, u^*) > \frac{1}{n} \sum e(P_i, u^*).$$

The proof of the claim is immediate: it takes less money to achieve u^* in each of the n periods with destabilized than with stabilized prices, so the average felicity level must be higher.

Remark: The level of expenditure necessary to achieve u^* with varying prices is most certainly not equal from time period to time period. For example,

$$e(P_1, u^*) \neq e(P_2, u^*)$$

if $P_1 \neq P_2$.

The second case usually claimed as representing instability is the equal-income case, i.e., $y_i = \bar{y}$. The problem is the sign of

$$n v(P^*, \bar{y}) \stackrel{?}{\lessgtr} \sum v(P_i, \bar{y}).$$

An immediate answer is not forthcoming via Jensen's inequality because the indirect felicity functions are merely quasiconcave and not concave in prices. This case is treated in detail by Shalit and Schmitz [4] and by Anderson and Riley [1]. In these results, the Arrow-Pratt coefficient of risk aversion, as well as more conventional measures relating to the demand for a good, determine the desirability of stabilization.

A more acceptable statement of the consumer problem would be as a dynamic program problem,

$$E V(\bar{y}) = \max_y [E v(P, y) + \delta E V(\bar{y} - y)],$$

where δ is some discount factor and y is first-period income. The discount factor is only necessary to keep the value of utility finite; reformulating the problem to have a finite number of periods would work just as well. Bewley [2]

considers general problems of this type. Under his conditions, he finds that, as $\delta \rightarrow 1$ and $N \rightarrow \infty$, the marginal utility of income becomes constant across time periods; he labels this the Permanent-Income case. Again, given a choice of stabilization or instability in n time periods, the assumption of Bewley's version of permanent income is sufficient to insure instability will be desired.

FOOTNOTES

* Giannini Foundation Paper No. .

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